Adaptative Mapping Functions

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In the aim to detect millimetric horizontal and vertical site displacements of geophysical origin, we investigate the problem of the propagation of electromagnetic GNSS signals through the troposphere.

Our approach is to ray-trace the propagation, integrating the eikonal differential system through the atmospheric refractivity structures provided by the ECMWF model levels at all elevations and azimuths, and to characterize the delays by several mapping functions relative to each kind of physical processes perturbing the propagation. We especially focus on the lateral azimuthal variability of the propagation, and map the various processes describing the delays and ray bending by adapting suitable mapping functions at each time step.

These newly adaptative mapping functions, developed at GRGS Toulouse (GRGS-T-AMF), summarize hundred thousands of rays in a few tens of coefficients at a few millimeters precision whatever the azimuth and for a five degrees elevation cutoff, and are suitable to correct GNSS signals at the measurement level.